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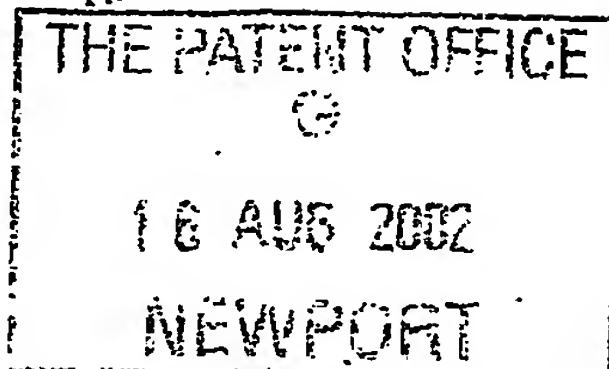
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1/77

# Request for grant of a patent

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The Patent Office

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16AUG02 E741507-1 DON/PM 8QQ  
P01/7700 0.00 0219066.8

1. Your reference

P31273-/MGO/JDB

2. Patent application number

(The Patent Office will fill in this part)

0219066.8

3. Full name, address and postcode of the or of each applicant (underline all surnames)

Scott-Track Limited  
68-82 Boden Street  
Glasgow  
G40 3PX

Patents ADP number (*if you know it*)

8447161001

If the applicant is a corporate body, give the country/state of its incorporation

United Kingdom

4. Title of the invention

"Turnout/Crossover Section for Railway Track"

5. Name of your agent (*if you have one*)

Murgitroyd & Company

"Address for service" in the United Kingdom to which all correspondence should be sent (*including the postcode*)

Scotland House  
165-169 Scotland Street  
Glasgow  
G5 8PL

Patents ADP number (*if you know it*)

1198015 ✓

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (*if you know it*) the or each application number

Country

Priority application number  
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Date of filing  
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7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(*day / month / year*)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (*Answer 'Yes' if:*

Yes

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
- See note (d))

# Patents Form 1/77

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Description 16

Claim(s) -

Abstract -

Drawing(s) 13 + 13 

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Priority documents -

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Statement of inventorship and right to grant of a patent (Patents Form 7/77) -

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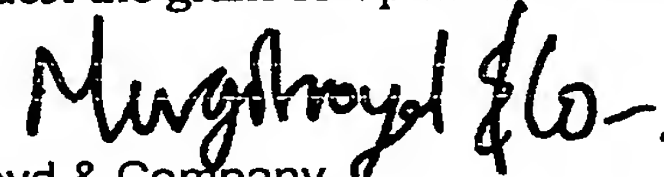
Request for substantive examination (Patents Form 10/77) -

Any other documents (please specify) -

11.

I/We request the grant of a patent on the basis of this application.

Signature

 Date 15/08/02

Murgitroyd & Company

12. Name and daytime telephone number of person to contact in the United Kingdom

James D Brown

01224 706616

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1     "Turnout/Crossover Section for Railway Track"

2

3     The present invention relates to a turnout or  
4     crossover section of railway track and particularly  
5     but not exclusively relates to providing a temporary  
6     non-intrusive turnout or crossover section of a  
7     railway track.

8

9     Railway track requires to be maintained at regular  
10    intervals and in order to do this, the section of  
11    track that is being maintained must be cleared of  
12    trains. This is done by transferring the trains  
13    from the track having the maintenance performed on  
14    it onto an adjacent track for a limited period (i.e.  
15    a few hours). The trains are transferred onto the  
16    adjacent track by means of a crossover section of  
17    track. Conventionally, crossover sections are  
18    intrusive in that the section of track at which the  
19    crossover section is inserted must be cut; this  
20    involves cutting the inside rail twice of each  
21    railway track and installing the temporary crossover  
22    and also installing the switchgear along with



1 providing an interface for signalling. However,  
2 such an intrusive crossover section is relatively  
3 expensive and requires a fairly long time to plan.  
4 The only other known alternative to solve this  
5 problem is to allow the trains to crossover at the  
6 nearest permanent crossover section but this may be  
7 many miles away and thus if repair or maintenance is  
8 required on only a few metres of track, trains may  
9 be forced to share one line of track for both  
10 directions for many miles or extensively diverted,  
11 thus leading to inefficiency and delays.

12  
13 Those in the rail industry will also realise that  
14 there is a conflict between passengers who require  
15 train services during the daytime and freight trains  
16 which operate during the night and thus there is  
17 very little time to effect such repairs and  
18 maintenance.

19  
20 According to a first aspect of the present invention  
21 there is provided a turnout for a railway track, the  
22 turnout comprising a raised track surface which is  
23 adapted to provide a path along which the wheels of  
24 a train can travel from one railway track to  
25 another, wherein the raised track surface is of a  
26 sufficient height such that the wheels of the train  
27 are arranged to clear the said railway track.

28  
29 According to a second aspect of the present  
30 invention there is provided a method of transferring  
31 a train from one railway track to a second railway  
32 track, the method comprising the steps of:-

1 providing a raised track surface which is adapted to  
2 provide a path along which wheels of the train can  
3 travel from the first to the second railway track;  
4 driving the train along the first track and onto the  
5 raised track surface, wherein the raised track  
6 surface is of a sufficient height such that the  
7 wheels of the train are arranged to clear at least  
8 one (and preferably both) of the first and second  
9 railway tracks.

10  
11 Typically, the turnout further comprises a ramp  
12 surface, wherein, the ramp surface is preferably  
13 tapered from a short or no height end to a  
14 relatively tall height end. Most preferably, the  
15 ramp surface comprises a linear taper from the short  
16 or no height end to the relatively tall height end  
17 and preferably the relatively tall height end is of  
18 the same height as that of the raised track surface.  
19 Typically, the relatively tall height end of the  
20 ramp surface is adjacent an end of the raised track  
21 surface, the two combining to provide a path along  
22 which the wheel is permitted to travel.

23  
24 Preferably, at least a portion of the raised track  
25 surface has a slot formed therein wherein the slot  
26 is preferably arranged to lie over or around the  
27 rail being crossed and is releasably fixed thereto.

28  
29 Typically, there may be two turnouts provided spaced  
30 apart along two railway tracks, the first turnout  
31 providing a path along which the wheels of a train  
32 can travel from a first railway track to a second

1 railway track, and the second turnout providing a  
2 path along which the wheels of the train can travel  
3 from the second railway track back to the first  
4 railway track.

5  
6 Typically, at least a portion of the raised track  
7 surface, which is preferably the same portion as  
8 before, is formed on top of a raised crossover  
9 member, wherein the height of the raised crossover  
10 member at least equals the depth of a flange portion  
11 of the wheel of the train.

12  
13 Typically, the raised track surface comprises a  
14 plurality of rail members, one or more of which  
15 comprise a curved radius away from one of the  
16 railway tracks towards the other railway track.

17  
18 Preferably, the plurality of rail members are  
19 releasably secured to the first and/or second  
20 railway tracks by a fixing means which may comprise  
21 a clamping means.

22  
23 Preferably, the one or more turnouts are temporary  
24 turnouts and more preferably are non-intrusive  
25 turnouts.

26  
27 Embodiments of the present invention will now be  
28 described, by way of example only, with reference to  
29 the accompanying drawings, in which:-

30  
31 Fig. 1 is a plan view of a temporary turnout in  
32 accordance with the present invention;

1        Fig. 2 is a plan view of a portion of the  
2        turnout of Fig. 1 highlighted as detail 1;  
3        Fig. 3a is a cross-sectional view across  
4        section B-B of Fig. 2;  
5        Fig. 3b is a side view of a portion of the  
6        turnout shown in the direction of A-A of Fig.  
7        2;  
8        Fig. 4 is a close up view of a G-clamp  
9        indicated in Fig. 6 as detail 2;  
10       Fig. 5 is a close up view of a G-clamp of Fig.  
11       7a indicated as detail 3;  
12       Fig. 6 is a cross-sectional view across section  
13       C-C of Fig. 1;  
14       Fig. 7a is a cross-sectional view across  
15       section D-D of Fig. 1;  
16       Fig. 7b is a side view of the portion of the  
17       turnout shown in Fig. 7a;  
18       Fig. 8 is a cross-sectional view across section  
19       E-E of Fig. 1;  
20       Fig. 9a is a close up plan view of the portion  
21       of the turnout indicated in Fig. 1 as detail 4;  
22       Fig. 9b is a cross-sectional view across  
23       section F-F of Fig. 9a;  
24       Fig. 10 is a perspective view photograph of a  
25       scale model of a temporary non-intrusive  
26       turnout in accordance with the present  
27       invention during installation;  
28       Fig. 11 is a perspective view photograph of the  
29       turnout section of Fig. 10 further on during  
30       construction;

1        Fig. 12 is a perspective view photograph of the  
2        turnout section of Fig. 11 further on during  
3        construction;

4        Fig. 13 is a perspective view photograph of the  
5        turnout section of Fig. 12 further on during  
6        construction;

7        Fig. 14 is a plan view photograph of one end of  
8        the turnout section of Fig. 13;

9        Fig. 15 is a perspective view photograph of a  
10       model taking the place of a train as it enters  
11       the turnout section of Fig. 14;

12       Fig. 16 is a perspective view photograph of the  
13       model of Fig. 15 as it progresses through the  
14       turnout section;

15       Fig. 17 is a perspective view photograph of the  
16       model of Fig. 16 as it progresses further  
17       through the turnout section; and

18       Fig. 18 is a perspective view photograph of the  
19       model of Fig. 17 as it nears the end of the  
20       turnout section.

21

22       Fig. 1 shows a non-intrusive turnout generally  
23       indicated as 10 in accordance with the present  
24       invention. It will be appreciated by the reader  
25       that two spaced apart non-intrusive turnouts 10 are  
26       utilised on a section of track to provide a non-  
27       intrusive crossover.

28

29       As shown in Fig. 1, the temporary non-intrusive  
30       turnout 10 links a south bound rail track 12 and a  
31       north bound rail track 14, such that a train (not  
32       shown) which has already been transferred from the

1 south bound rail track 12 to travel south along the  
2 north bound rail track 14 can be transferred back  
3 onto the south bound rail track 12. In this manner,  
4 the portion of the south bound rail track 12' can be  
5 repaired/maintained. The skilled reader will  
6 realise that other routes of transfer could be  
7 installed and adopted.

8  
9 The temporary non-intrusive turnout 10 comprises a  
10 number of components which will now be described.

11  
12 The non-intrusive turnout 10 comprises a pair of  
13 turnout tracks 16, 18 and a plurality of temporary  
14 sleepers 20. For ease of reference, the turnout  
15 track 16 will be referred to as the left hand  
16 turnout track 16 and the turnout track 18 will be  
17 referred to as the right hand turnout track 18.

18  
19 The left hand turnout track 16 comprises, from the  
20 left hand end of the Fig. 1, a ramp rail 22L. The  
21 uppermost portion of the ramp rail 22L is wedge  
22 shaped, with the uppermost surface tapering linearly  
23 from its left most end which has a height of 0mm up  
24 to its right most end which has a height of  
25 approximately 50mm and this linear tapering can be  
26 best seen in Fig. 7B which shows that the ramp rail  
27 22 has a sufficient length, in the region of 1700mm,  
28 such that the angle of tapering is relatively  
29 gradual. The ramp rail 22L is coupled to the north  
30 bound left hand rail track 14L by means of a G-clamp  
31 mechanism 32 as shown in Fig. 5; it should be noted  
32 however that other types of clamp mechanisms could



1 be utilised. The ramp rail 22 comprises a head  
2 portion 51 which rests on top of the upper flat  
3 surface of the rail track 12, 14. A neck portion 53  
4 extends downwardly from the inner most edge of the  
5 head portion 51, where the neck portion 53 is shaped  
6 to substantially match the shape of the inside face  
7 of the rail track 12, 14.

8  
9 The G-clamp mechanism 32 comprises a G-shaped clamp  
10 34, one end of which surrounds and is compressed  
11 against, the opposite upstanding face of the rail  
12 track 12, 14 to the neck portion 53. A vice 36  
13 extends toward the neck portion 53 of the ramp rail  
14 22 from the other end of the G-shaped clamp 34, such  
15 that the vice 36 can be forced or urged into secure  
16 connection with the neck portion 53. Preferably,  
17 the vice 36 is of a type that can be readily  
18 assembled and disassembled in a short amount of  
19 time.

20  
21 Following on from the ramp rail 22L from left to  
22 right, the left hand turnout track 16 next comprises  
23 a switch rail 24L, the left hand most end of which  
24 is arranged to butt against the right hand most end  
25 of the ramp rail 22L, as shown in Fig. 7b. As shown  
26 in Fig. 6, the switch rail 24L, 24R comprises a  
27 respective head portion 55L, 55R and the switch rail  
28 24L, 24R is inwardly curved along its length, toward  
29 the south bound rail track 12 and thus away from the  
30 north bound rail track 14. In other words, the end  
31 of the switch rail 24L adjacent to the ramp rail 22L  
32 is located directly above the north bound rail track

1 14L whilst the opposite end of the switch rail 24L  
2 is displaced from the north bound rail track 14L.  
3 Nevertheless, the head portion 55L comprises a  
4 linear height of approximately 50mm arranged  
5 horizontally along its length. The switch rail 24L  
6 also comprises a neck portion 57L. Conveniently,  
7 and as shown in Fig. 4, the neck portion 57L may  
8 have a slot formed in it at the end of the switch  
9 rail 24L closest to the ramp rail 22L, such that the  
10 upper most portion of the north bound rail track 14L  
11 can protrude inwardly through said slot.  
12 Alternatively, the slot may be omitted, with the  
13 neck portion 57L following the shape of the inside  
14 face of the north bound rail track 14L. The switch  
15 rail 24L is secured in a releasable fashion to the  
16 north bound rail track 14L by means of a G-clamp  
17 mechanism 62 which operates in a similar fashion to  
18 the G-clamp mechanism 32 of Fig. 5. The G-clamp  
19 mechanism 62 as shown in Fig. 4 comprises a similar  
20 G-shaped clamp 64 and a vice 66. The switch rail  
21 24L is supported at its middle and right hand most  
22 end from underneath by the G-clamp mechanism 62 and  
23 temporary sleepers 20. It should be noted that the  
24 term "inside face" is used in the sense that it is  
25 the face that the respective turnout track 16, 18 is  
26 being turned away from.

27  
28 Following on from the switch rail 24L from left to  
29 right, the left hand turnout track 16 next comprises  
30 a gutt rail 26L. The gutt rail 26L has an I-shaped  
31 cross-section which is broadly similar to the I-  
32 shaped cross-section of a normal rail track such as

1 12, 14. The gutt rail 26L continues to bend at  
2 approximately the same radius as the bend radius of  
3 the switch rail 24L. The clamping mechanism of the  
4 gutt rail 26L to the north bound rail track 14L is  
5 similar to that as shown in Fig. 8 which will be  
6 described subsequently. Again, the gutt rail 26L is  
7 supported from underneath by the clamping mechanism  
8 and temporary sleepers 20 to have its upper flat  
9 horizontal surface to be approximately 50mm above  
10 the south bound 12 and hence north bound 14 rail  
11 tracks.

12  
13 Up until this point, the right hand turnout track 18  
14 substantially mirrors that of the left hand turnout  
15 track 16, since the right hand turnout track 18  
16 comprises, from left to right in Fig. 1, a ramp rail  
17 22R, a switch rail 24R and a gutt rail 26R.

18  
19 The left hand turnout track 16 from left to right  
20 after the gutt rail 26L comprises a straight rail  
21 28L which thus has no bend radius and which once  
22 again is supported by the temporary sleepers 20 to  
23 have its upper flat horizontal surface to be  
24 approximately 50mm above the south bound 12 and  
25 hence north bound 14 rail tracks.

26  
27 Following immediately on from the straight rail 28L,  
28 the left hand turnout track 16 comprises a crossing  
29 rail 30L which is broadly similar to the crossing  
30 rail 30R which will be described subsequently.

31

1 Immediately following on from the gutt rail 26R, the  
2 right hand turnout track 18 comprises a crossing  
3 rail 30R which is shown in more detail in Fig. 2 and  
4 Figs. 3A and 3B. The crossing rail 30R comprises a  
5 substantially I-shaped cross-section toward and at  
6 both its ends which is substantially the same I-  
7 shaped cross-section as the existing south bound 12  
8 and north bound 14 rail track. Thus, towards and at  
9 its ends, the crossing rail 30R comprises a head  
10 portion 59 and a neck portion 61. However, a slot  
11 or gap 31 is provided along a portion of the length  
12 of the crossing rail 30R about the mid point of the  
13 crossing rail 30R such that there is no neck portion  
14 61 in the region of the slot 31 as shown most  
15 clearly in Fig. 3B. The crossing rail 30R is  
16 arranged to lie across the north bound rail track  
17 14L such that the north bound rail track 14L lies  
18 within the slot 31. Accordingly, since the crossing  
19 rail 30R is again supported from underneath by the  
20 temporary sleepers 20 to have its head portion 59  
21 with a height of approximately 50mm and since the  
22 crossing rail 30R is arranged to be horizontal, the  
23 upper most surface of the crossing rail 30R is  
24 approximately 50mm higher than the upper most  
25 surface of the south bound 12 and north bound 14  
26 rail tracks.

27

28 The right hand turnout track 18 next comprises from  
29 left to right and immediately after the crossing  
30 rail 30R, a straight rail 28R which is substantially  
31 identical in function and arrangement to the  
32 straight rail 28L previously described. Similarly,

1 the crossing rail 30L is substantially identical to  
2 the crossing rail 30R in function and arrangement  
3 except that the crossing rail 30L crosses over the  
4 south bound rail track 12R.

5  
6 The left hand turnout track 16 follows on from left  
7 to right after the crossing rail 30L with a gutt  
8 rail 42L which is followed by a switch rail 44L  
9 which is in turn followed by a ramp rail 46L which  
10 are respectively substantially identical to the gutt  
11 rails 26L, switch rail 24L and ramp rail 22L in  
12 function and arrangement.

13  
14 The right hand turnout track 18 follows on from the  
15 straight rail 28R from left to right with a gutt  
16 rail 22R which is followed by a switch rail 44R  
17 which is in turn followed by a ramp rail 46R which  
18 are respectively substantially identical in function  
19 and arrangement to the gutt rail 26R, the switch  
20 rail 24R and the ramp rail 22R.

21  
22 As shown in Fig. 8, the gutt rails 42L, 42R (and  
23 thus the gutt rails 26L, 26R) are clamped to the  
24 south bound rail tracks 12L, 12R by means of a J  
25 block arrangement 68L, 68R and a lengthened G-clamp  
26 mechanism 70L, 70R. The J block arrangement 68L and  
27 G-clamp mechanism 70L will now be described, but  
28 those skilled in the art will realise that the J  
29 block arrangement 68R and G-clamp mechanism 70R are  
30 substantially identical to the J block arrangement  
31 68L and G-clamp mechanism 70L except that they are  
32 rotated through 180°. The gutt rail 42L is spaced

1     apart from the south bound rail track 12L by means  
2     of the J block arrangement 68L which is preferably  
3     formed from any hard material that is shaped to fit  
4     into the heart of the rail to maintain a set  
5     distance between the rails. As shown in Fig. 8, the  
6     J block arrangement 68L is arranged such that it not  
7     only spaces the gutt rail 42L horizontally apart  
8     from the south bound rail track 12L but it also  
9     spaces them vertically apart, such that the upper  
10    most horizontally arranged surface of the gutt rail  
11    42L is approximately 50mm vertically above the upper  
12    most horizontally arranged surface of the south  
13    bound rail track 12L. The G-clamp mechanism 70L  
14    clamps the gutt rail 42L to the south bound rail  
15    track 12L via the J block arrangement 68L and the G-  
16    clamp mechanism 70L once again comprises a vice 76L  
17    or a bolted fixing through the rail 12L, 42L and J  
18    block arrangement 68L or similar arrangement..

19  
20    It should be noted that, as shown in Fig. 9A, the  
21    left hand 16 and right hand 18 turnout tracks may be  
22    provided with a pot sleeper arrangement 80, where  
23    the two pot sleeper arrangements 80L, 80R are  
24    coupled to one another via a rigid frame 82L, 82R,  
25    where the rigid frame 82L, 82R may be provided in  
26    two halves, 82L, 82R which are coupled to one  
27    another at their outer most ends via a suitable  
28    fixing means 84 such as nuts and bolts (not shown).  
29    Thus, the pot sleeper arrangement 80L, 80R can be  
30    used either to replace the temporary sleepers 20 or  
31    could be provided on top of an in-situ or existing



1 timber sleeper, in order to provide increased  
2 rigidity to the non-intrusive temporary turnout 10.

3

4 Fig. 10 shows a scale model of a non-intrusive  
5 turnout 10 part way through construction; it should  
6 be noted however that the scale model shown in Fig.  
7 10 omits the straight rails 28L, 28R and also the  
8 switch rails 44L, 44R but it is envisaged that the  
9 straight 28L, 28R and switch 44L, 44R rails would be  
10 used in a full size rail track 12, 14.

11

12 Fig. 10 shows that a couple of temporary sleepers 20  
13 have been laid, and the gutt rails 42L, 42R have  
14 been secured to the temporary sleepers 20 and also  
15 secured to the south bound track 12L, 12R. It  
16 should also be noted that the gutt rails 42R are in  
17 essence longer versions of the switch rails 44L, 44R  
18 in the model shown in Fig. 10 through Fig. 18. The  
19 crossover rail 30L has also been installed such that  
20 it crosses over the south bound rail track 12R.

21 Fig. 11 shows that the gutt/switch rail 26L has been  
22 installed next and is followed by installation of  
23 the gutt/switch rail 26R in Fig. 12 and is followed  
24 by the crossover rail 30R as shown in Fig. 13.

25 Thereafter, the ramp rails 22L, 22R are secured to  
26 the respective north bound rail tracks 14L, 14R.

27

28 A model of a train 5 is shown in Fig. 15 as having  
29 travelled south along the north bound rail track 14  
30 and having mounted the ramp rails 22L, 22R. It is  
31 important to note that the ramp rails 22L, 22R raise  
32 the wheels of the train (not shown) and thus the

1 model train 5 by an amount sufficient such that the  
2 flanged part of the wheel is just vertically above  
3 the height of the rest of the normal track 14L, 14R.  
4 Thus, and as shown in Fig. 16, when the model train  
5 moves onto the crossing rails 30L, 30R, the left  
6 hand 16 and right hand 18 turnout tracks are of a  
7 sufficient height such that the flanged part of the  
8 wheel 7, which normally acts to keep the model train  
9 5 and thus full size trains on the tracks, is able  
10 to clear the north bound rail track 14L and then the  
11 south bound rail track 12R. The model 5 is shown in  
12 Fig. 17 as continuing through the non-intrusive  
13 temporary turnout 10 until it reaches the position  
14 shown in Fig. 18 which shows the model 5 about to  
15 travel down the ramp rails 46L, 46R and then onward  
16 as per normal south along the south bound rail track  
17 12.

18  
19 The embodiment of the non-intrusive turnout 10  
20 described herein has the great advantage that the  
21 rail tracks 12R and 14L do not require to be cut  
22 which would be normal if a conventional intrusive  
23 temporary turnout was to be inserted in to the  
24 tracks 12, 14. Furthermore, those skilled in the  
25 art will appreciate that, if a train requires to  
26 pass through the non-intrusive temporary turnout 10  
27 without actually crossing over from one track 12  
28 onto another track 14, the ramp rails 22 or 46 as  
29 required can be removed along with the respective  
30 switch rails 24 or 44 and crossing rail 30L or 30R  
31 and as such the train will be able to bypass the  
32 non-intrusive temporary turnout 10.

1  
2 Modifications and improvements may be made to the  
3 embodiments described herein without departing from  
4 the scope of the invention. For instance, the  
5 height of approximately 50mm of the various  
6 components of the non-intrusive temporary turnout 10  
7 can be varied to suit the flanges provided on the  
8 wheels of trains in different countries and may be  
9 adapted to accommodate various track gauges. Those  
10 skilled in the art will realise that the height of  
11 the various components simply needs to be equal to,  
12 or more preferably just slightly higher than the  
13 extent of the flange provided on the wheels of  
14 trains in each particular country.

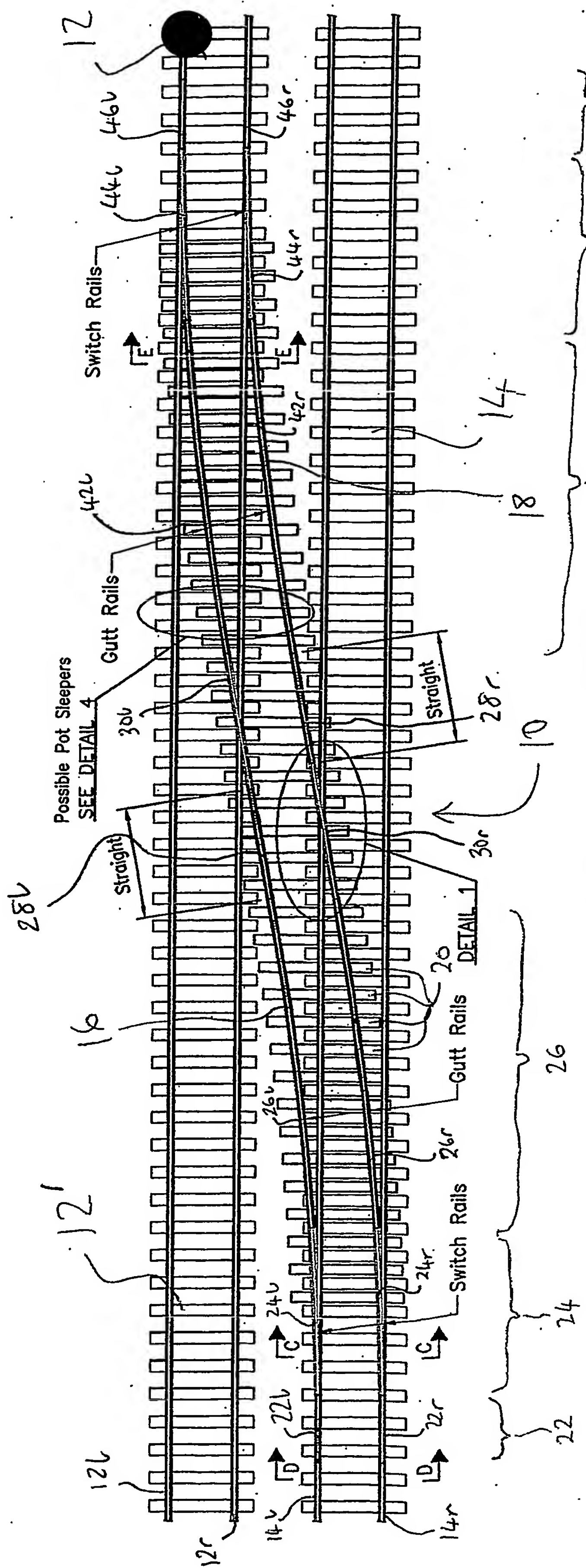
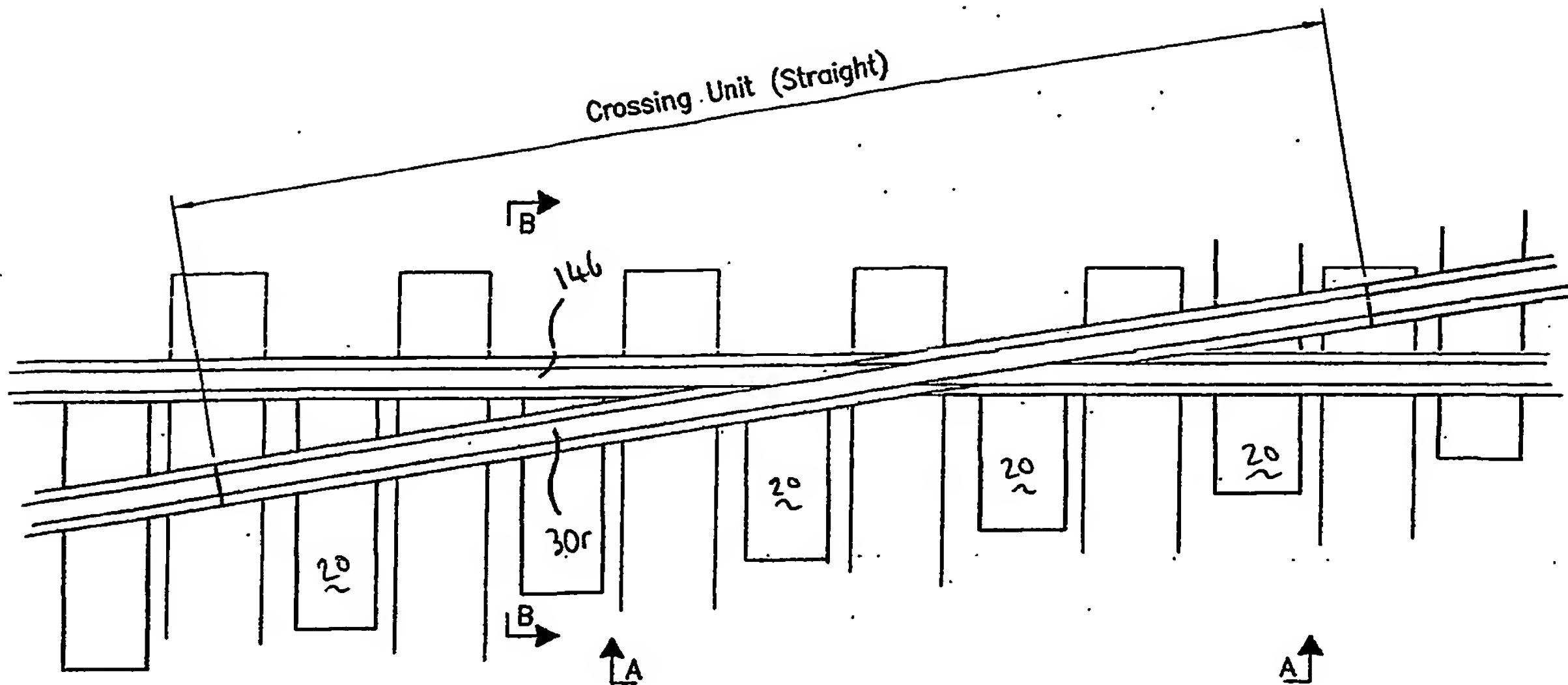


Fig. 1

PLAN ON RAIL CROSSOVER  
Scale 1:100

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DETAIL 1  
(SIM 2 PLACES)  
Scale 1:20

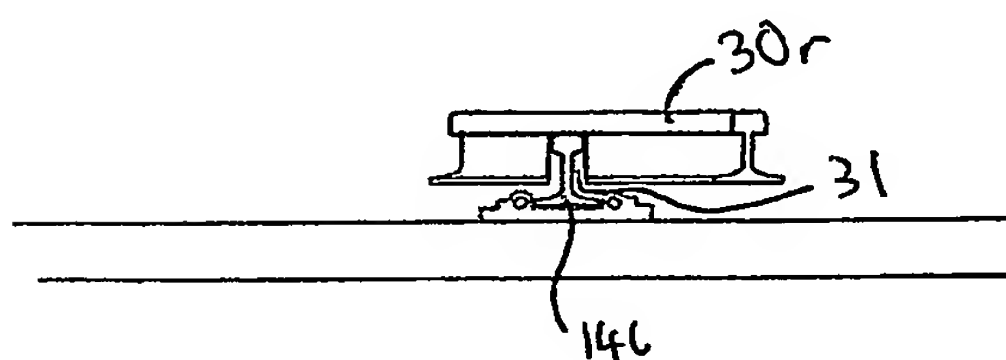


Fig. 3(a)

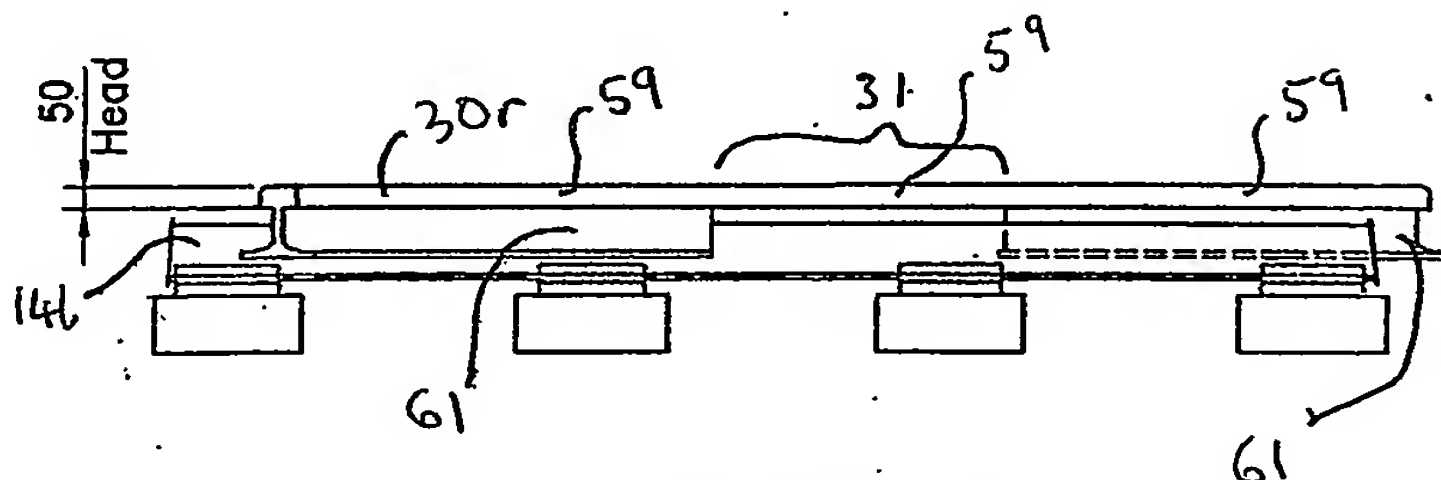


Fig. 3(b)

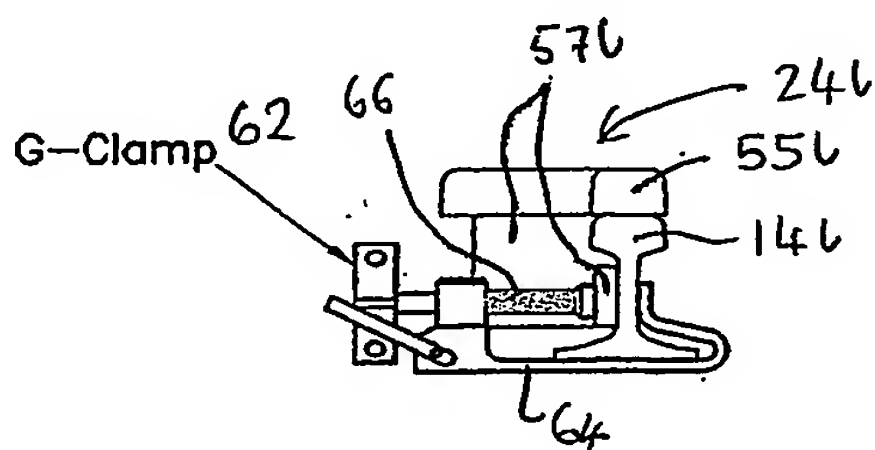


Fig. 4

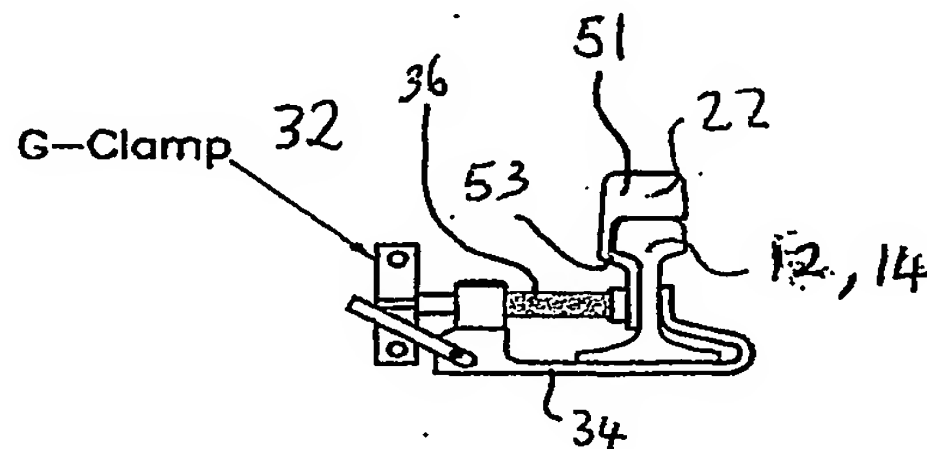
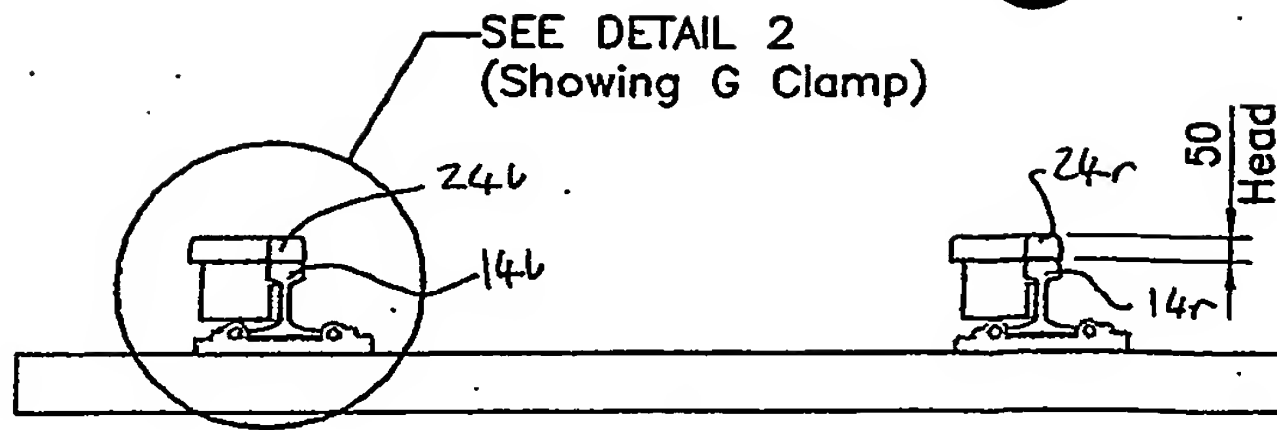


Fig. 5

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SECTION C-C  
Scale 1:20

Fig. 6

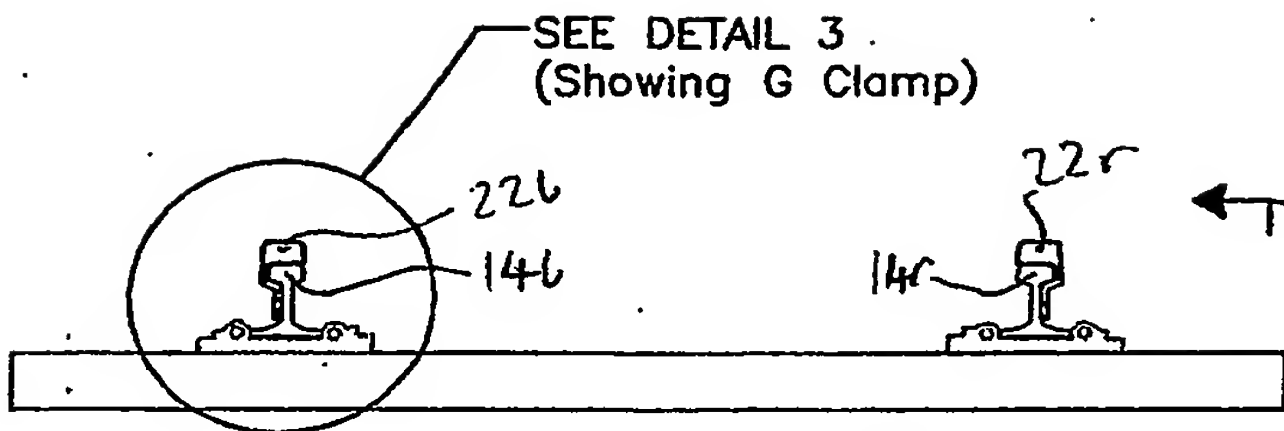


Fig. 7(a)

SECTION D-D  
Scale 1:20

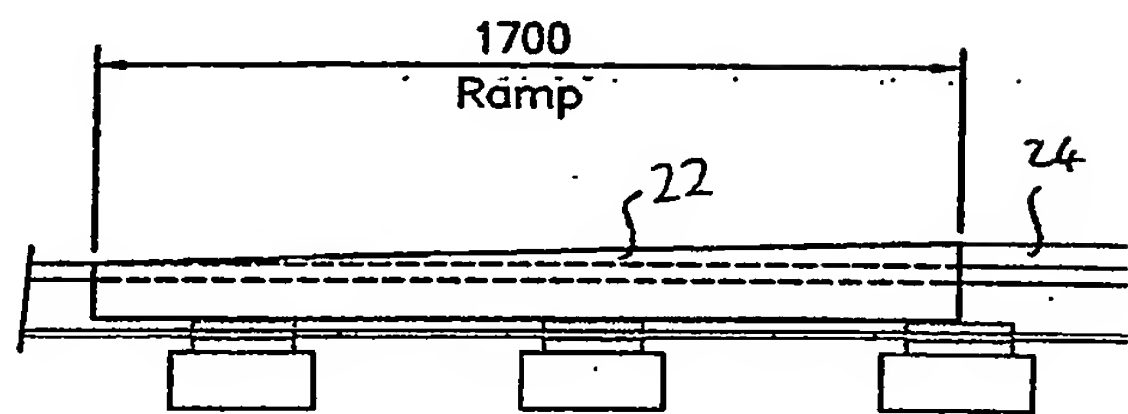
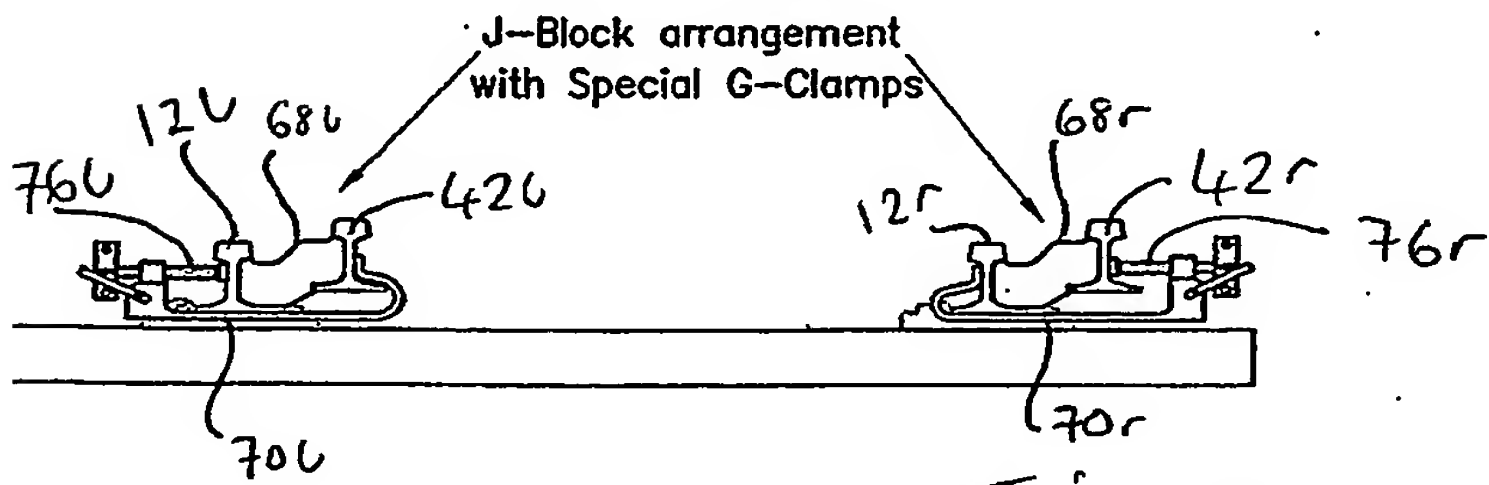


Fig. 7(b)



SECTION E-E  
Scale 1:20

Fig. 8



Fig. 9(a)

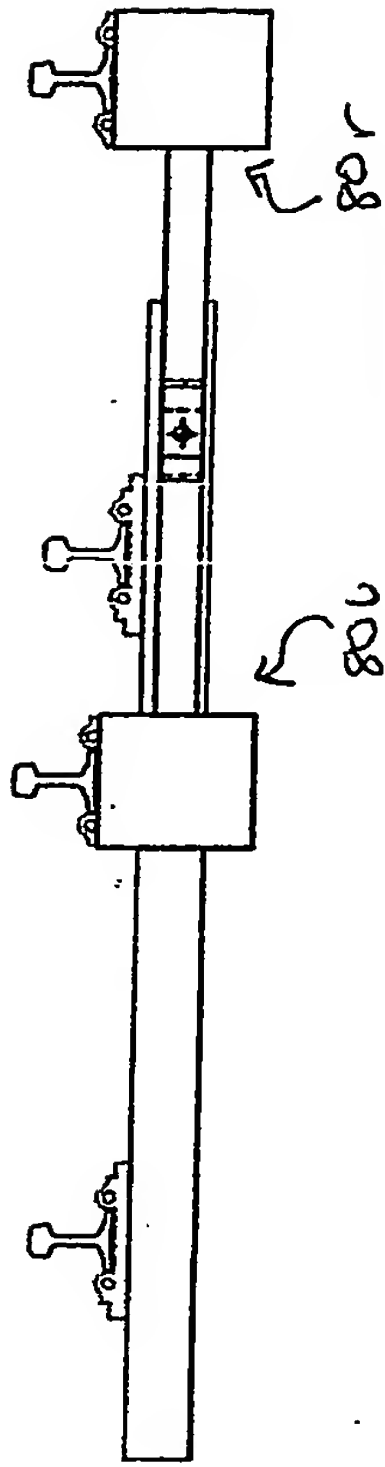
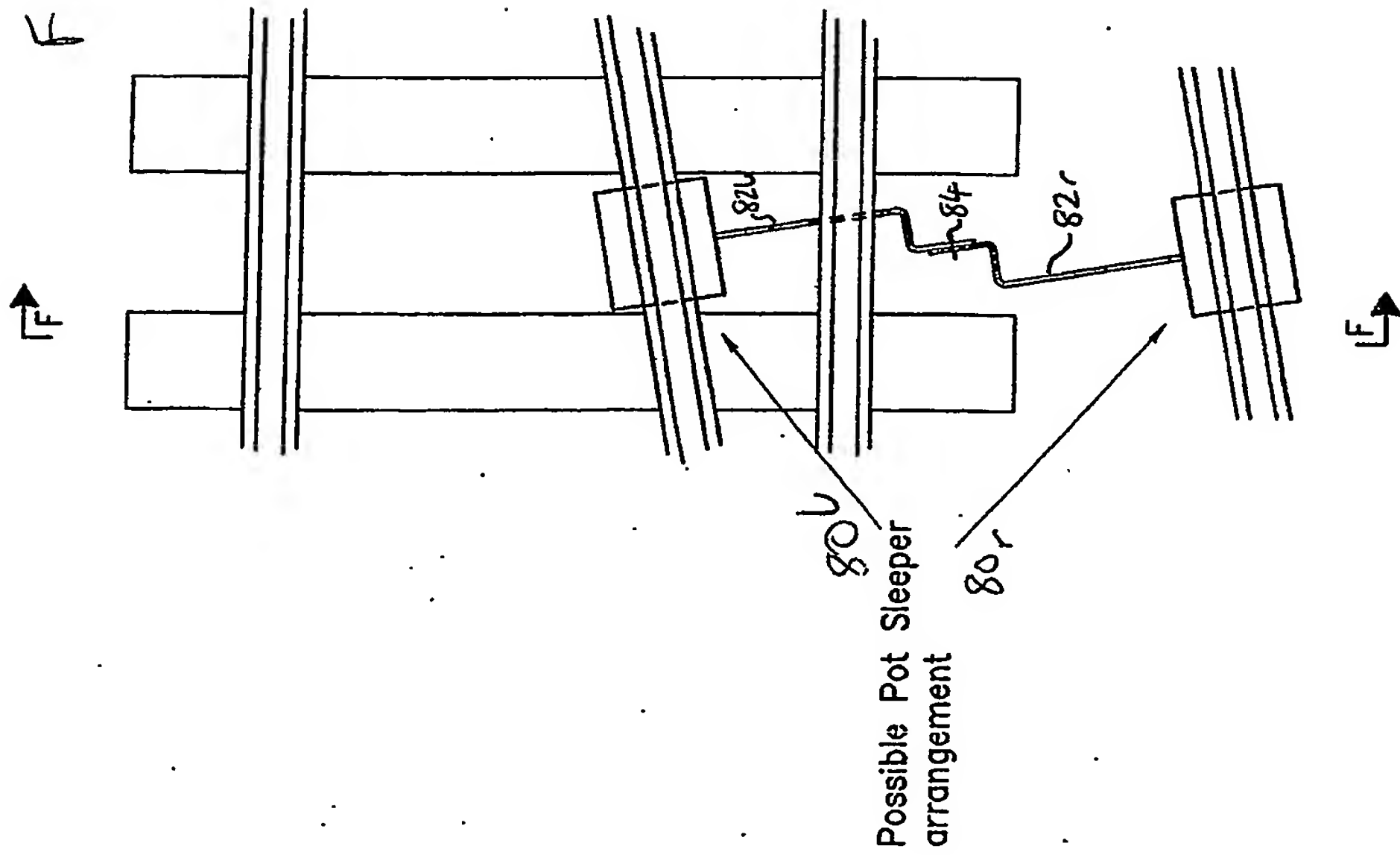


Fig. 9(b) SECTION F-F  
Scale 1:20

DETAIL 4  
Scale 1:20



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20

300

300

20

20

20

420

~120

140

~140

420

Fig 10



613

101

306

42

Fig. 11



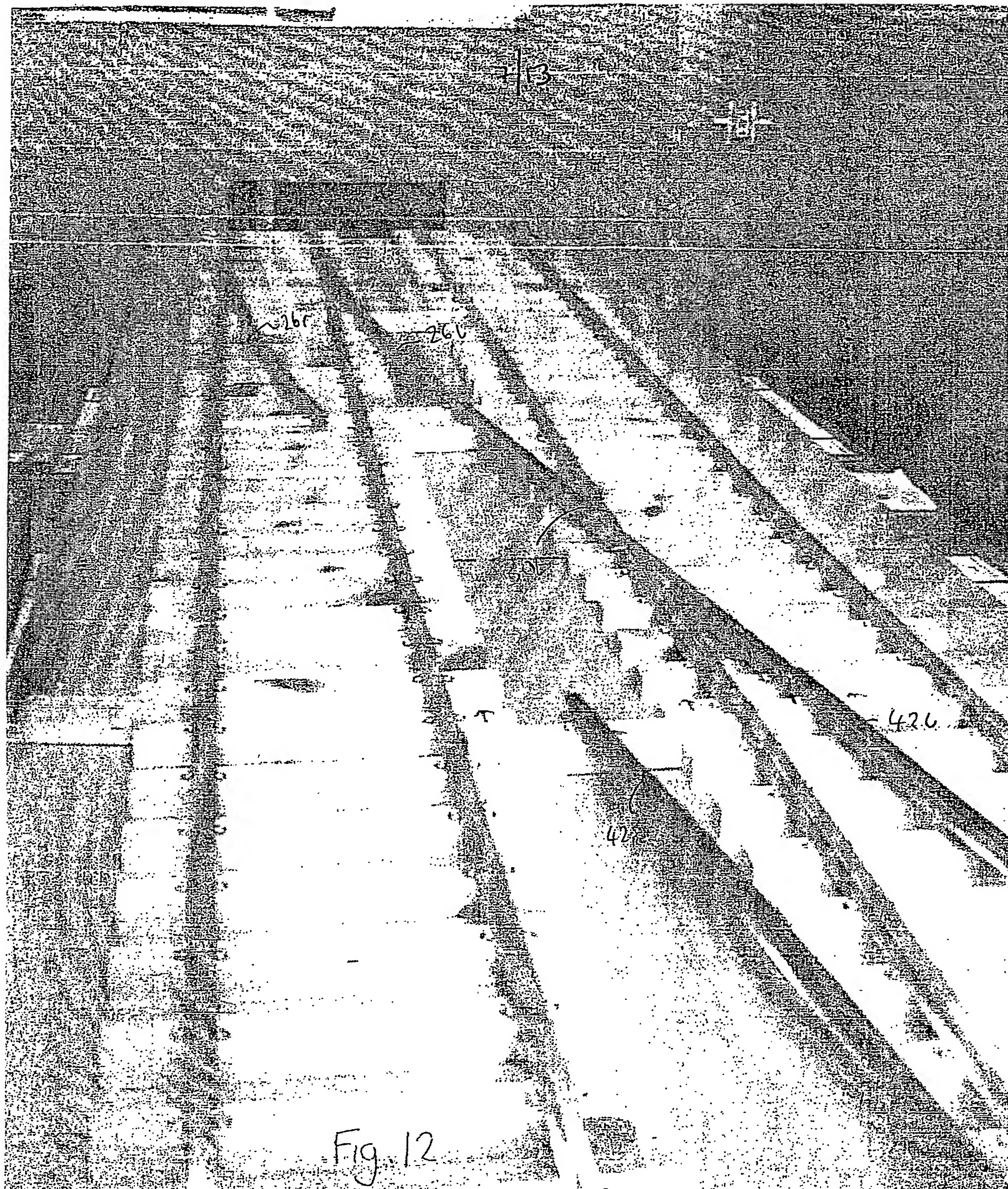




Fig. 13

426

426

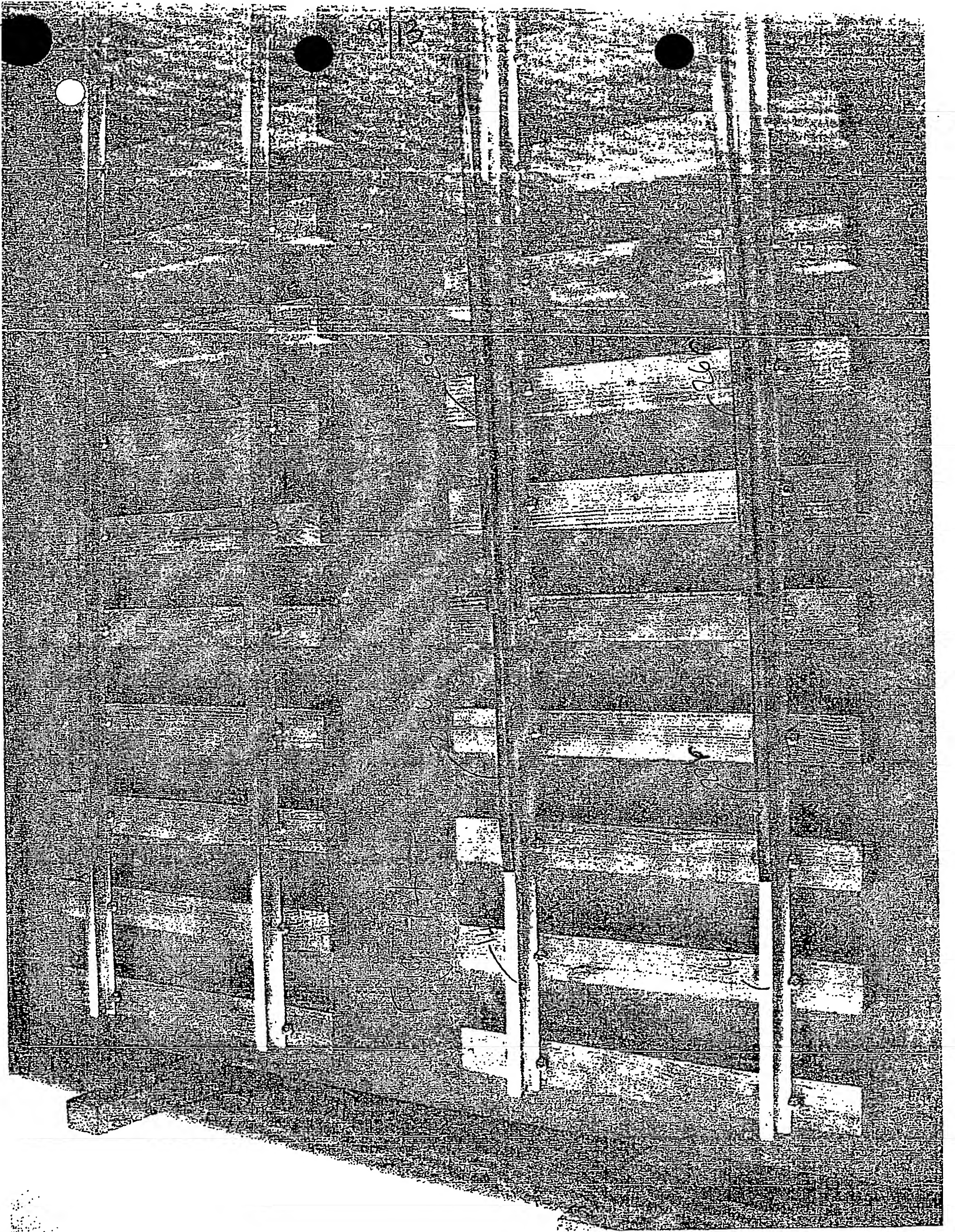
306

306

206

166





13

276



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Fig 15





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121

306

121

142

141

306

261

Fig. 16



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42b

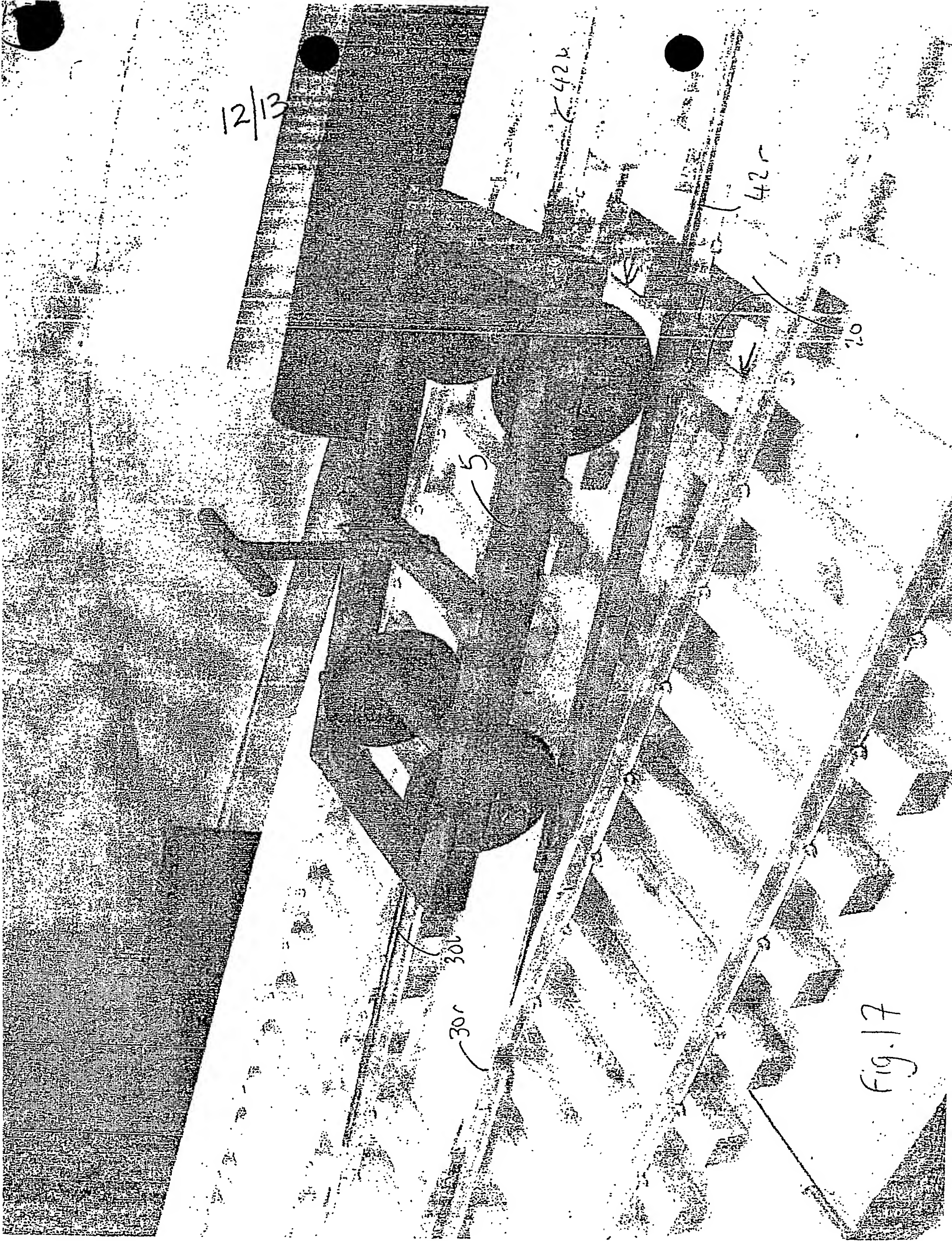
42r

10

30r

30r

Fig. 17





13/13

460 - 12

- 12

46

141

14

5

441

446

Fig. 18



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